

**WHAT IS CLAIMED IS:**

1. A method for producing useful substances by culturing microorganisms requiring oxygen, the method comprises the steps of:
  - 5 (a) introducing pure oxygen to a microbial culture process;
  - (b) recycling the off-gas of the microbial culture process to a pressure swing adsorption (PSA) system to remove carbon dioxide and to recover pure oxygen;
  - (c) introducing the recovered pure oxygen to the microbial culture process;
  - 10 and
  - (d) repeating the steps (b) and (c).
2. A method for treating wastewater with microorganisms requiring oxygen, the method comprises the steps of:
  - 15 (a) introducing pure oxygen to a wastewater treatment process;
  - (b) recycling the off-gas of the wastewater treatment process to a pressure swing adsorption (PSA) system to remove carbon dioxide and to recover pure oxygen;
  - (c) introducing the recovered pure oxygen to the wastewater treatment
  - 20 process; and
  - (d) repeating the steps (b) and (c).
3. The method according to claim 1 or 2, wherein the separate air or high-concentration oxygen is fed to the PSA system upon the recycling of the off-gas.
- 25 4. The method according to claim 1 or 2, wherein oxygen content of the pure oxygen is 85~100%.